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Long-Ago Peoples May Have Been Long in the Tooth

Life may have been nasty and brutish for our prehistoric forebears, but it wasn't necessarily short. Contrary to the notion that it was rare for someone to reach the age of 40 in prehistoric societies, studies of modern hunter-gatherer groups suggest that a substantial proportion of our ancestors survived into their 70s, says an anthropologist who has been studying indigenous people in Bolivia.

Age old pattern. A Tsimane senior citizen in Bolivia.

Speaking last week at the meeting of the Human Behavior and Evolution Society in Philadelphia, Pennsylvania, Michael Gurven of the University of California, Santa Barbara, reported on mortality data collected from 10 modern-day groups of hunter-gatherers and forager-horticulturists, including the Tsimane Indians in north-central Bolivia, which he and Hillard Kaplan of the University of New Mexico have studied since 2001.

Gurven's analysis revealed that 40% to 50% of the members of these groups never make it to age 15. But their prospects brighten after that, he says: A 15-year-old has a 40% chance of reaching 65, and by the time they reach 70, the mortality rate is no higher than for a U.S. resident. Evolutionary psychologist Daniel J. Kruger of the University of Michigan, Ann Arbor, says the new work "challenges current thought on … the shape of the hominid survival curve." Gurven and other scientists estimate ages and mortality of contemporary indigenous groups through a variety of convergent techniques, including interviews, old missionary records, historical events, and photographs. In contrast, reconstructions of prehistoric populations rely primarily on skeletal data.

"Some reconstructions of prehistoric populations tend to show life expectancies of 15 to 25 years," Gurven says, "with relatively low infant and child mortality but extremely high adult mortality." Not only is Gurven's work at odds with that scenario, but he says that "adult life expectancy is remarkably similar across these groups."

The research points to an existence structured around longevity. "Adult-level production is controlled by skills and knowledge rather than physical restraints," says Gurven. Although the men in these groups reach the height of their physical powers in their 20s, it is not until their 40s that they reach the peak of hunting prowess, he notes. Rice production by males peaks in their 50s, as they turn from hunting to less rigorous agricultural pursuits. And there is a pattern of resource flow from old to young that continues into the 70s.

Kruger says the research indicates that "once individuals pass the concentrated risk in infancy and early childhood, they are more likely to survive into the older age range (65–75) than previously thought." University of Michigan, Ann Arbor, anthropologist Rachel Caspari, who studies ancient populations, says that it's not possible to know whether prehistoric people were living as long as modern hunter-gatherers without "high-resolution" ways of determining ages of death from fossils. However, she says Gurven's results make sense and that her research supports the notion of a "modern human demographic pattern" that probably has pertained for the past 30,000 years.

Gurven reported that the leading causes of death among those middle-aged and older appear to be from infections and violence. But these indigenous groups share some of the same scourges of aging that affect modern societies. By the age of 65, he says, "almost all have significant pain" from orthopedic problems, especially back pain.

CREDIT: PHOTO COURTESY OF MICHAEL GURVEN

An Evolutionary Squeeze on Brain Size

Despite the huge individual differences in mental abilities, the size of the human brain varies remarkably little from person to person. In fact, brain volume is evolutionarily more stable than that of any other bodily organ, researchers reported last week. They speculate that our brain, after increasing dramatically in size in early human evolution, ran up against the skull-size limitations imposed by the female birth canal.

Evolutionary psychologists Geoffrey Miller of the University of New Mexico, Albuquerque, and Lars Penke of Humboldt University in Berlin calculated for the human brain a measure called "coefficient of additive genetic variance," or CVA. A formula involving the size range of a physical feature and its heritability, CVA reflects "evolvability": that is, the extent to which the relevant genes are susceptible to change through mutation and natural selection.

The heritability of brain is remarkably high—about 0.9, studies have shown. That makes brain size even more genetically influenced than height, according to Miller. Despite the brain's complexity, he says, "at the genetic level, [brain size] seems as if it's a really simple trait like fruit fly bristle number, … astonishingly ironclad against any environmental perturbation."

Miller notes that he and Penke were surprised at the relatively low CVA for the human brain, because they assumed it had been subject to intense selection. CVAs are likely to be higher for traits that are fitness-related and therefore good candidates for natural selection. But the brain's CVA of 7.8, low for a volumetric trait, means there is limited potential "evolvability." Other features with substantial heritability, such as breasts and kneecaps, have much higher CVAs, said Miller.

Certainly, there has been selection for brain volume in the past, said Miller: As hominids became more intelligent, their brain size tripled over a 2-million-year period to about 1400 cubic centimeters, compared with 370 for chimps. But its growth plateaued about 200,000 years ago, Miller speculates, when it "reached the physical constraint of pelvic size." As a result, he says, brain size "is not a good index of IQ in recent evolution." Adds Penke: "Virtually all theories of brain and intelligence evolution propose a recent history of directional [i.e., 'more is better'] selection for both." But "recent directional selection" on intelligence must have worked on brain features other than absolute size.

That notion is corroborated by brain-imaging studies, says Richard Haier of the University of California, Irvine. Although the correlation between brain size and IQ is only a modest 0.4, he says, the latest imaging studies show much higher correlations of IQ with a "small number of discrete areas" of gray matter.

–CONSTANCE HOLDEN

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